



Silicone based bimodal networks applicable as electroactive systems

Bejenariu, Anca Gabriela; Lotz, Mikkel; Boll, Mads; Vraa, Christoffer; Skov, Anne Ladegaard

Published in:

1st International Conference on Electromechanically Active Polymer (EAP) transducers & artificial muscles

Publication date:

2011

[Link back to DTU Orbit](#)

Citation (APA):

Bejenariu, A. G., Lotz, M., Boll, M., Vraa, C., & Skov, A. L. (2011). Silicone based bimodal networks applicable as electroactive systems. In *1st International Conference on Electromechanically Active Polymer (EAP) transducers & artificial muscles*

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Silicone based bimodal networks applicable as electroactive systems

Anca G. Bejenariu, Mikkel R. Lotz, Mads Boll, Christoffer Vraa, and Anne L. Skov*

Department of Chemical and Biochemical Engineering, DTU

The dielectric elastomers (DE) are part of the electronic electroactive polymers (EAPs) and present a good combination of electromechanical properties such as high achievable strains and stresses, fast response speeds, long lifetime, high reliability and high efficiency. A polymer network is a three-dimensional entity formed by the interconnection of polymer chains and is sometimes referred to as an elastomer. In the present paper elastomeric bimodal networks are synthesized using two different molecular weight vinyl-terminated polydimethyl siloxanes (short PDMS chains and long PDMS chains), a 4-functional crosslinker and a platinum-catalyst. The bimodal networks are prepared using a 'two-step four-pot' mixing procedure. The pre-premixes A contain PDMS and crosslinker, while the pre-premixes B contain PDMS and catalyst. Films with a thickness of 100 μm are prepared using an in-house constructed coating device. The viscoelastic behaviour as function of the applied frequency (LVE diagram) is shown for different systems with varying stoichiometric values and the short chain:long chain mass ratio. The macromolecular structure of the new silicone networks is a controlled alternance between strength and flexibility/elasticity. The final networks are characterized by a low viscous dissipation and a low elastic modulus. The systems have promising properties for DEAP purposes as they are highly extendible, with a fast response, and have great stability and hence postpone the rupture.

References:

1. Pelrine, R., Kornbluh, R., Pei, Q. and Joseph, J., "High-speed electrically actuated elastomers with strain greater than 100% " *Science* 287, 836-839 (2000)
2. Bejenariu, A.G., Boll, M., Lotz, M.R., Vraa, C. and Skov, A.L., "New elastomeric silicone based networks applicable as electroactive systems," *SPIE Smart Structures*, San Diego, (2011)